WHAT IS CLAIMED IS:

1. A process for the continuous production of polyurethane foam from at least one polyol component and at least one isocyanate component using CO_2 as blowing agent comprising:

a) mixing at least one filler with at least a portion of one of the isocyanate or polyol components,

b) exposing the mixture produced in a) to a shear velocity between 10000 s^{-1} and 200000 s^{-1} either during or subsequent to mixing to obtain a virtually agglomerate-free mixture,

c) passing the filler-containing mixture through at least one filter element to remove oversize grains, residual agglomerates and / or impurities,

d) adding the CO_2 to at least a portion of one of the isocyanate or polyol components to generate a mixture which comprises liquid CO_2 and optionally filler,

e) mixing the CO_2-containing mixture, the filler-containing mixture and any other reactive component or additive,

f) decompressing the mixture from e) by dividing that mixture into a plurality of streams having a shear velocity above 500 s^{-1}

g) reducing flow velocity of the streams generated in f),

h) discharging the streams from g) to a substrate, and

i) allowing the discharged material to cure to form a polyurethane foam.

2. The process of Claim 1 which further comprises mechanically cleaning at least one filter element used in c).

3 The process of Claim 1 in which a two-dimensionally filtering filter element is used in c).

4. The process of Claim 3 further comprising cleaning the two-dimensionally filtering filter element mechanically.

5. The process of Claim 1 in which the filler is passed through a filter cascade in c).

6. The process of Claim 1 in which the finest filter stage used in c) is coarser by a factor of 1 to 10 than the filler's top cut.

7. The process of Claim 1 in which the finest filter stage used in c) is coarser by a factor of 1.2 to 7 than the filler's top cut.

8. The process of Claim 1 in which the finest filter stage used in c) is coarser by a factor of 1.5 to 5 that the filler's top cut.

9. The process of Claim 1 in which the CO_2-containing mixture and the filler-containing mixture are mixed or combined with each other before mixing with the other component(s).

10. The process of Claim 9 in which the pressure of the mixture which comprises CO_2 and filler is reduced before mixing with the other component(s).

11. The process of Claim 1 in which the pressure of the reactive mixture is reduced with the aid of an adjustable choke body before discharge.

12. The process of Claim 1 in which the filler is supplied by means of a feed screw in continuous manner to a premixer maintained at virtually constant pressure in which the filler and at least portion of the polyol or isocyanate component are mixed.

13. The process of Claim 1 in which the filler is taken into the at least portion of the polyol or isocyanate component by low pressure.

14. The process of Claim 13 in which the filler is flooded with CO_2 before mixing the filler and at least portion of polyol or isocyanate component so that at least some atmosphere surrounding the filler is replaced by CO_2.

15. The process of Claim 12 in which the filler is flooded with CO_2 before mixing the filler and at least portion of polyol or isocyanate component so that at least some atmosphere surrounding the filler is replaced by CO_2.

16. The process of Claim 1 in which the filler is pre-sieved before incorporation into at least a portion of the polyol or isocyanate component.

17. An apparatus for the continuous production of polyurethane foam comprising: (1) at least one storage vessel for each of the isocyanate component, polyol component, liquid carbon dioxide and any additive; (2) a feeding device for each of the isocyanate component, polyol component, any additive and liquid carbon dioxide; (3) a main mixer for mixing the isocyanate component and the polyol component; (4) a pipe between each of the storage vessels and the main mixer; (5) at least one container for receiving or storing the filler; (6) an apparatus for the admixture of the filler into the isocyanate component or the polyol component; and (7) an apparatus for comminution of agglomerates in the filler in which

(a) means for transporting filler-containing mixture comprises at least one filter,

(b) a supply pipe coming from the CO_2 storage vessel opens into at least one pipe connecting the storage vessel for the isocyanate component or the polyol component to the main mixer,

(c) a mixing apparatus for mixing-in and dissolution of the CO_2 into the polyol or isocyanate component is arranged between the CO_2 supply pipe where it opens into the isocyanate component or polyol component supply pipe and the main mixer, and

(d) a discharge body which generates a sudden change of pressure comprising at least one fine-meshed sieve is arranged downstream of the main mixer.

18. The apparatus of Claim 17 in which the apparatus for the comminution of agglomerates is based on rotor-stator principle.

19. The apparatus of Claim 17 in which the apparatus for the comminution of agglomerates comprises at least one nozzle or perforated orifice plate.

20. The apparatus of Claim 17 which further comprises a means for mechanically cleaning at least one filter.

21. The apparatus of Claim 17 which further comprises a continuous drive for mechanically cleaning at least one filter.

22. The apparatus of Claim 17 in which at least one filter comprises a two-dimensionally filtering filter element.

23. The apparatus of Claim 17 in which at least one filter having a two-dimensionally filtering filter element comprises an apparatus for mechanical cleaning.

24. The apparatus of Claim 17 in which at least one filter having a two-dimensionally filtering filter element and a means for mechanically cleaning comprising a continuous drive are present.

25. The apparatus of Claim 17 in which the means for transporting filler-containing mixture comprises at least two filters which are connected in series to form a filter cascade.

26. The apparatus of Claim 17 in which the discharge body comprises at least one sieve having openings that in at least one dimension are at least 1.2 to 10 times as large as openings in the finest filter.

27. The apparatus of Claim 17 in which the discharge body comprises at least one sieve having openings that in at least one dimension are at least 1.5 to 5 times as large as openings in the finest filter.

28. The apparatus of Claim 17 in which the discharge body comprises at least one sieve having openings that in at least one dimension are at least 1.8 to 4 times as large as openings in the finest filter.

29. The apparatus of Claim 17 in which the discharge body comprises at least one sieve having hole cross-sections in at least one dimension between 0.03 mm to 1 mm.

30. The apparatus of Claim 17 in which the discharge body comprises at least one sieve having hole cross-sections in at least one dimension between 0.07 and 0.7 mm.

31. The apparatus of Claim 17 in which the discharge body comprises at least one sieve having hole cross-sections in at least one dimension between 0.3 mm and 0.5 mm.

32. The apparatus of Claim 17 in which the discharge body comprises at least two sieves which are consecutive in the direction of flow and are arranged relative to one another so that no hole of the first sieve is aligned with a hole of the second sieve.

33. The apparatus of Claim 17 in which an adjustable choke element is positioned between the main mixer and the discharge body.

34. The apparatus of Claim 17 in which the means for admixture of the filler includes a premixer and a feed screw embodied as a compression screw.

35. The apparatus of Claim 17 in which the means for admixture of the filler comprises a vessel equipped with a stirrer.